

Broccoli Packs Punch to Bladder Cancer Cells

Researchers have isolated compounds from the vegetable broccoli that they believe may help prevent or slow the progress of bladder cancer, according to Science Daily.

The current work builds on a major study conducted six years ago by

Harvard and Ohio State universities that found that men who ate two or more half-cup servings of broccoli per week had a 44 percent lower incidence of bladder cancer compared to men who ate less than one serving each week.

"We're starting to look at which compounds in bro-

ccoli could inhibit or decrease the growth of cancerous cells," said Steven Schwartz, a study co-author and a professor of food science and technology at Ohio State University.

Some 63,000 people will be diagnosed with bladder cancer this year, according

to the American Cancer Society. And more than 13,000 will die.

The researchers isolated compounds called glucosinolates from broccoli sprouts. During chopping, chewing and digestion, these phytochemicals morph

into nutritional powerhouses called isothiocyanates--compounds that the scientists believed play a role in inhibiting cancer.

Their hunch was right, at least in the laboratory experiments. There, isothiocyanates hindered the growth of bladder cancer cells. And the most pro-

found effect was on the most aggressive form of bladder cancer they studied.

They first extracted and measured the levels of glucosinolates from broccoli sprouts. They then used a process that uses enzymes to convert the glucosinolates to isothio-

cyanates.

While young sprouts naturally have higher concentrations of these phytochemicals than full-grown broccoli spears, eating the spears also provides health benefits, Schwartz said.

He and his colleagues treated two human bladder cancer cell lines and one

mouse cell line with varying amounts of glucosinolates and isothiocyanates. Even though glucosinolates are converted to isothiocyanates, the researchers wanted to know if the former would have any effect on controlling the growth of cancer cells.

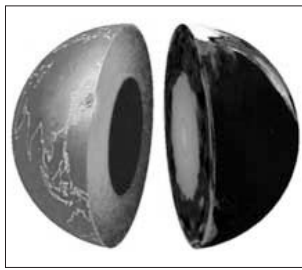
New Way to Peek Inside Earth

The heart of our planet is largely a mystery because scientists can't go there or see what's inside. Geologists have just one tool, seismology, with which to probe the inner Earth.

According to Live Science, the contents of the tool bag just doubled.

For the first time, researchers have detected tiny particles called geoneutrinos coming from deep within the Earth. The discovery is expected to shed light, almost literally, on the contents and processes of the planet's insides.

"There are still lots of theories about what's really inside the Earth," said Giorgio Gratta, a physics professor at Stanford University and part of the 87-member team that made the discovery. Earth's core is incredibly hot and dense. The outer part of the core is thought to be liquid, while intense pressure forces the inner core of iron to be solid. The exact composition of the core and the lower reaches of the mantle, which surround the core,



Geoneutrinos detected by KamLAND (l) and the Earth's structure (r).

are not known.

"We only know essentially the crust of our planet," Gratta explained. "Beyond a few kilometers, you simply don't have access."

For years, Gratta and others have sought to see deep inside Earth by watching what comes out. Scientists know the planet is heated in two ways. Leftover heat from the planet's formation is stored in the core and released gradually. Second, the radioactive decay of rocks releases heat. Scientists do not know how much heat each process contributes.

But they know how important the question is. The inner heat drives volcanic activity and the shifting crust, which leads to earthquakes. Heat sculpts the planet.

Here's what turned out to be useful: When rocks decay radioactively, subatomic particles called geoneutrinos are released.

Particles representing the decay of uranium and thorium, specifically, were detected in the new experiments by a Japanese apparatus called KamLAND.

Quantum Boost for Optical Clocks

Physicists in the US have demonstrated a new form of laser spectroscopy that could lead to more accurate atomic clocks, PhysicsWeb said. The team used techniques developed for quantum computing to make highly accurate measurements on ions that are not suitable for existing approaches to precision spectroscopy.

Existing atomic clocks rely on microwave transitions in caesium atoms, but devices based on much faster optical transitions would be even more accurate.

Such clocks could lead to the second being redefined and could also be used to check if the fundamental physical constants are truly constant.

An aluminium ion is a good candidate for making an optical clock because it has a very narrow transition between two of its energy states. However, it is difficult to study because it cannot be cooled or measured with existing laser techniques.

The use of extremely cold ions leads to more accurate measurements because it reduces the Doppler shifts that would otherwise broaden the transition line being observed.

The NIST team began by trapping the two ions in an electromagnetic Paul trap and then used a laser to create a quantum superposition of the ground and excited state of the aluminium ion. Both ions were then cooled to the motional ground state of the trap.

Next another laser was applied to transfer the internal state of the aluminium into a superposition of the motional states of the two ions: roughly speaking, the two states in the superposition were both ions at rest and both ions moving together.

Finally, they applied a laser pulse that transferred this superposition to a superposition of internal states in the beryllium ion, which they can probe with well established laser spectroscopy techniques.

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